

BERKELEY – STANFORD CE & M WORKSHOP DEFINING A RESEARCH AGENDA

PROCESS/PRODUCT DEVELOPMENT IN 2000 BEYOND

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Personal Profile

The author is responsible for research and postgraduate activities across all subject areas at the University of Salford, UK. (Salford is a technological university with around 20,000 students and received the highest quality assessment rating for its work in the Built Environment in the UK). He has also led the Construction IT and Management areas at the University, which includes over 130 postgraduates and over 1.5 million dollars of research income per annum. Nationally he Chairs several Committees including the assessment of research quality in the Built Environment for all UK universities and is the only academic member of the Construction Research and Innovation Strategy Panel determining a research strategy in construction for the UK. He was also Chairman of the Science and Engineering Research Council Construction Committee and is International Chairman of the Environment Theme of CERF 2000 Conference.

Background

In the past decade there have been considerable efforts in the UK to identify what are the perceived needs for research priorities. These include a Technology Foresight exercise for construction engaging 800 industry leaders, the 'Latham' report suggesting a less adversarial team approach, but with target reductions in costs and deficits, and more recently The 'Egan' Report, engaging major industry clients who addressed drivers and further targets for industry improvement. Each of the professional institutions, too, have determined their own research agenda. This massive rise in activity trying to determine what should be done has increased sensitivity to research within the UK industry, but has done little, so far, to change industry culture to the point where the industry is receptive to the research results of its research institutions. There are, of course, major exceptions and interestingly enough these appear to be driven by senior personnel who have been educated, trained and gained experience in other industries. Stripped of the baggage of traditional construction approaches they find common problems and generic solutions despite the unique differences as perceived by construction industry personnel. Indeed some of the best research work in the UK is being undertaken by researchers whose first discipline is not within construction. They bring knowledge of their own domain eg. information technology, process engineering, general management and design, etc, to the construction problem. A construction background, by the nature of the industry, often creates a generalist who links specialisms, but who does not provide the in-depth knowledge required to produce radical change. Nevertheless the skill and ability to build bridges in knowledge and create multi-disciplinary teams must not be underestimated in terms of their contribution to problem solving.

Unless the issues of the industry culture and its knowledge base are understood and properly addressed, then no vision or research agenda will have impact.

The Industry

If we assume that construction is considerably behind the other major industries of the world we have to understand what this means.

I would suggest the following:-

In terms of efficiency it has few benchmarks; it involves too many interfaces resulting in breakdowns in communication and mis-matches resulting in poor quality of construction leading to defects; it still relies too heavily on site manufacture; it measures productivity through aggressive tendering thus undervaluing the skill base; it has no formal information structure for operationalising efficiency opportunities through the supply chain; it is weak in supply chain management and the structure of the industry migrates against the kind of advances seen in other industries in this field; it's human resources are largely craft based whereas other industries are knowledge based; it is under capitalised and over-manned; it is dangerous; life cycle management it too diversified.

The above are only examples, but they identify problems which research must address. Often the research agenda is put forward as a cost reduction and defects reduction issue. Whilst this may be part of the end result the issue is far more complex and involves elevating the industry to a world leader in harnessing the knowledge and skills already present in other industries. To do this profitability must increase to the point where investment in technology and process management advancement is able to be significantly increased. This may involve education of both construction and client sectors. Some clients already recognise this need and they recognise that only in partnership between supply and demand sectors will real advances be made. Small savings achieved by cut throat tendering from the clients point of view, often undermines the investment by the contracting sector, which might have in turn, led to real advances in which both sides benefit. There is a long/medium term potential conflict between cost reduction as a site/project problem solving research issue and cost reduction (and quality enhancement) as a result of knowledge building and a rethink of the total process from cradle to grave.

The Vision

In view of the current position of the construction industry (there is little doubt that given the choice we, almost certainly, would not have started from here!) we need to imagine the whole industry as a virtual organisation which can only be integrated and enhanced by technologies which support virtual working. Geography, fragmentation, adversarial positions based on poor communication, supply chain discontinuities etc, mean that progress will not be made until all parties can act together for mutual advantage. This is not something which can be driven by any one organisation from the supply side, but can be addressed by government and the key players on the demand side.

The vision is therefore:-

A competitive industry working collaboratively for mutual advantage harnessing the power of the new information technologies in order to reduce conflict, aid communication, seek efficiencies, upgrade the industry and its staff to be comparable with other industries, delivering a product over its full life cycle which is of high quality, high value and responsive to time objectives by those commissioning the product.

If this is the vision, then a research agenda can emerge.

The Research Agenda

The agenda is potentially vast and therefore only the highest priority items are identified.

Technologies:

- Virtual reality as a 'front end' to communication and to provide visual expression and testing, include design/product/construction simulation
- Management of distributed object technology to aid communication across the whole supply chain and to create efficiency by rapid object assembly across the net.
- Integration of design and manufacture harnessing the power of the above technologies

Systems and Methodologies

- Benchmarking of current performance
- Modelling of both process and product to establish an integrated model of the building design, construction, operation environment.
- Process protocols for decision making and process improvement with the emphasis on less production
- Life cycle analysis

Procurement

- Analysis of the supply chain for process improvement
- 'Partnering' and Procurement processes to develop new relationships for mutual improvements in efficiency

Culture

(Changing the industry to be receptive to new research)

- New methods of learning to rapidly ‘up-grade’ the industry linked to virtual environments and ‘just-in-time’ knowledge
- Research benchmarking to monitor progress and identify achievement for adoption. (Recognition of the ‘building blocks’ of knowledge)
- Industry ownership of innovation and development of a pre-competitive research environment in which firms can work together.
- Knowledge warehousing for knowledge sharing based on above.

In a statement of this kind it is not possible to amplify or qualify the above. Each area would need to be developed into a research programme with specific objectives, but there is a need for a group (preferably international) which would ensure that the research ‘projects’ are undertaken within a framework which will allow them to share knowledge, collaborate together and integrate their activity. The true benefit will come when there is a critical mass of projects, across the spectrum described, working together for integrated mutual advantage.

There is a need for an international team to pull together the work and drive it forward without being too prescriptive. It has worked well within the automobile industry – there is no reason why we should not develop something similar.

Best of luck!